Math 361   **Numerical Analysis**   _Taylor Larreohea_
9/5/19   Quiz 3   Name

Answer the following questions in the space provided. **Show all work.** (30 pts. total.)

1. Let $p = \sqrt{3}$ and $p^* = 1.67$.

(a) Find the relative error. (5 pts.)

$$R.E = \frac{|P - P^*|}{|P|} = \frac{|\sqrt{3} - 1.67|}{|\sqrt{3}|} = 0.0358250605 = 3.5825 \times 10^{-2}$$

$$\boxed{R.E = 3.5825 \times 10^{-2}}$$

(b) To how many significant digits does p^* approximate p? Justify your answer. (5 pts.)

P^* approximates p to 2 significant figures because the t value on the relative error is equal to 2.

2. Use computer arithmetic with three digit chopping to perform the following computation. Be sure to show all intermediate steps. (10 pts.)

$$\frac{2}{7} + \frac{5}{16}$$

$$\frac{2}{7} = 0.2857142857 \approx 0.285$$

$$\frac{5}{16} = 0.312$$

$$\frac{2}{7} + \frac{5}{16} = 0.285 + 0.312 = 0.597$$

$$\boxed{\frac{2}{7} + \frac{5}{16} = 0.597}$$

3. Use the 64-bit long real format to find the decimal equivalent of the following floating-point machine numbers. Be sure to show all supporting work. (10 pts)

0   10000000110   1000101010000000000000000000000000000000000000000000

$$\# = (-1)^S \cdot 2^{C-1023} (1+f)$$

$$S = 0$$

$$C = 0 \cdot 2^0 + 1 \cdot 2^1 + 1 \cdot 2^2 + 1 \cdot 2^{10} = 2 + 4 + 1024 = 1030 : C = 1030$$

$$f = 1 \cdot \frac{1}{2}^1 + 1 \cdot \frac{1}{2}^5 + \frac{1}{2}^7 + \frac{1}{2}^9 = \frac{277}{512} : f = \frac{277}{512}$$

$$\# = (-1)^0 \cdot 2^7 \cdot (1 + 277/512) = 197.25$$

197.25